PATENT
910000-2012

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s)	:	Kochevar et al
Serial No.	:	09/781,577
For	:	PHOTOCHEMICAL TISSUE BONDING
Filed	:	February 12, 2001
Examiner	:	Thomas C. Barrett
Art Unit	:	3738

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450** on the date shown below.

Amy Leahy, Reg. No. 47,739

Name of Applicant, Assignee or Registered Representative

Amy Leahy by Deborah A. Lu (Reg. No. 50,940)

Signature

April 2, 2004

Date of Signature

DECLARATION OF MICHAEL R. HAMBLIN PH.D. UNDER 37 C.F.R. § 1.132

I declare as follows:

1. I am familiar with U.S. patent application No. 09/781,577 ("the present application"), and its prosecution. In particular, I have carefully reviewed the application. My curriculum vitae is attached under Tab A. I respectfully submit that I am qualified to speak and render opinions as to the disclosure in the present application and the state of the art, as I am considered an expert in the field and have familiarity with the present application and its prosecution.

2. I am familiar with the Office Action mailed December 2, 2003 ("the Office Action"), issued by the United States Patent and Trademark Office in connection with the present application and make this Declaration in response thereto. I understand that the Office Action asserts that U.S. Patent No. 5,552,452 ("the Khadem patent") discloses a method for adhering tissue comprising: contacting a tissue with a photosensitizer, creating a

tissue-photosensitizer mixture, applying electromagnetic energy without more than a 1 degree rise in temperature, and creating a tissue seal without contacting the tissue with an exogenous cross-linkable substrate.

3. The relevant section of the Khadem patent referenced by the Office Action, at column 7 lines 18-30, is as follows:

> "The present invention also encompasses methods for tissue closing or wound healing wherein the actual preparation of a separate protein or peptide containing composition is not necessary. Such methods utilize the peptides or proteins located naturally within the tissue area as in situ protein containing compositions. To form an adhesive connection between biological tissues in this manner one would form a biologically effective amount of a tissue adhesive combination at the tissues by applying only the photosensitizer component to the tissues. One would then again apply electromagnetic radiation to the tissue adhesive combination thus formed in a manner effective to promote the formation of an adhesive connection between the tissues."

4. These methods are not discussed or exemplified further by Khadem. It is my opinion, as one skilled in the art who has read the Khadem patent, that portions of the patent other than column 7 lines 18-30 cannot be relied upon for additional instruction because they are solely intended for methods that require application of an exogenous substrate (see paragraph 5). Consequently, the Khadem patent provides no description of specific tissues in which the methods at column 7 lines 18-30 can be effectively practiced, no indication of specific photosensitizers (or excitation wavelengths thereof) that will be effective in the absence of the substrate and perhaps most telling, no exemplification of methods for creating a tissue seal in the absence of the substrate. None of the Examples in Khadem demonstrate that a tissue seal can be formed without administration of an exogenous cross-linkable substrate.

5. Column 7, lines 18-30 of the Khadem patent—which amount to no more than four sentences—fail to provide any guidance to one of ordinary skill in the art with respect to methods of producing a tissue seal without administration of an exogenous cross-linkable substrate. For example, Khadem states that its methods can be applied to a variety of tissues including the cornea and other tissues of the eye (column 8 line 29 and Example 8) and that the photosensitizer applied can be methylene blue (column 4 line 64-66). However, as can be seen from Example 5 of the present application, the photosensitizer

methylene blue is not effective in repair of corneal lesions. This discrepancy clearly illustrates the limitations of the Khadem patent. The teachings of Khadem do not provide adequate guidance or instruction for applications conducted in the absence of an exogenous substrate, as can be ascertained from its discussion of methylene blue. Accordingly, methods conducted in the absence of an exogenous substrate are outside the scope of what can be practiced by one of ordinary skill in the art who follows the teachings of the Khadem patent. Even further, at the time the present application was filed, a reading of the Khadem patent would not have provided one of ordinary skill in the art with the ability to combine its teachings with his own knowledge, in order to practice methods for adhering tissue in the absence of an exogenous substrate.

6. In addition, Khadem contemplates use of the proteins as filler material, which creates gaps between the surfaces to be joined. It is also my opinion that the methods of Khadem do not propose to form bonds between two tissue surfaces that are very closely positioned. Consequently, the surface area of the tissue to be bonded by the methods of Khadem is small. Methods of tissue bonding in which two tissue surfaces can be very closely positioned are only disclosed by the present application. Khadem provides no description of such methods.

7. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful statements may jeopardize the validity of the application or any patent issued thereon.

Dated 3/23/04 By: _____

Michael R. Hamblin, Ph.D.
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Department of Dermatology
Harvard Medical School
Wellman Center for Photomedicine
Massachusetts General Hospital
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TAB A

PART I: GENERAL INFORMATION

Date Prepared: 1/22/04

Name: Michael R. Hamblin

Office Address: Massachusetts General Hospital
Wellman Laboratories of Photomedicine
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Boston, MA 02114

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Home Address: 350 Revere Beach Boulevard, Revere, MA 02151

Place of Birth: Tynemouth, Northumberland, U.K.

Education:

1970	B.Sc.	Hons. Exeter University, U.K. Chemistry
1972	M.Sc.	University of Kent at Canterbury, U.K. Enzyme Chemistry
1977	Ph.D.	Trent Polytechnic, U.K. Synthetic Organic Chemistry

Postdoctoral Training:

1976-1978	Postdoctoral Fellow, Dept of Chemistry, New University of Ulster, U.K.
1978-1979	Postdoctoral Fellow, Dept of Chemistry, University of Edinburgh, U.K.
1979-1982	Postdoctoral Fellow, Dept of Chemistry, Heriot-Watt University, U.K.

Academic Appointments:

1982-1984	Research Fellow, Dept of Biochemistry, University of Cambridge, U.K.
1984-1987	Research Associate, Dept of Chemistry, Leicester University, U.K.
1990-1994	Cancer Research Campaign Research Fellow, University of Dundee U.K.

1994-1997	Instructor, Wellman Laboratories of Photomedicine, Department of Dermatology, Harvard Medical School
1997-	Assistant Professor of Dermatology, Wellman Laboratories of Photomedicine, Department of Dermatology, Harvard Medical School

Hospital Appointments:

1990-1994	Associate in Surgery, Ninewells Hospital and Medical School, Dundee, U.K.
1994-	Assistant in Chemistry, Department of Dermatology, Massachusetts General Hospital

Major AdministrativeResponsibilities:

1999	Member: Wellman Laboratories of Photomedicine Education Committee
2000	Member: Wellman Laboratories of Photomedicine Cell Biology Faculty Search Committee
2000	Member: Massachusetts General Hospital Subcommittee on Research Animal Care (IACUC)
2000-2003	Director: Wellman Laboratories Fall Tutorial Series
2002	Member Wellman Laboratories of Photomedicine Finance Committee
2003	Joint Chair Wellman-MIT Lester-Wolfe semi annual symposium

Industrial Experience:

1987-1990 Managing Director, Columbine Ltd., Brighton, U.K.

Professional Societies:

2003	American Society of Photobiology, Member
2004	European Society for Photobiology, Member
2002	American Association for Cancer Research, Member

Peer reviewing manuscripts for the following Journals:

Journal of Photochemistry and Photobiology. B: Biology
Photochemistry and Photobiology
Lasers in Surgery and Medicine
Journal of Biomedical Optics
International Journal of Radiation Biology

British Journal of Cancer
IEEE Journal of Selected Topics in Quantum Electronics
Applied Optics
Cancer Research
Journal of Antimicrobial Chemotherapy
Journal of Pharmacology and Experimental Therapeutics
Biochimica et Biophysica Acta
International Journal of Cancer
Antimicrobial Agents and Chemotherapy
Advanced Drug Delivery Reviews
Archives of Biochemistry and Biophysics

Peer reviewing grants for the following awarding bodies:

Ligue Suisse Contre le Cancer, Bern, Switzerland
National Cancer Institute of Canada, Toronto, ON, Canada
U.S. Civilian Research and Development Foundation (CRDF-ISTC)
Association for International Cancer Research, St Andrews, UK

PART II: RESEARCH AND TEACHING CONTRIBUTIONS

A. Major Research Interests:

Photodynamic therapy (PDT) is a relatively new and exciting approach for treating cancers and other diseases. Photosensitizers (PS) are administered systemically, locally or topically and accumulate in the tumor or other lesion. Illumination with visible (usually red light, frequently from a laser) excites the sensitizer, which in the presence of oxygen, produces cytotoxic or stimulatory effects. My particular area of interest is in the study of macromolecular conjugates of PS as targeting agents. Large molecules have very different biodistribution and pharmacokinetics compared to the small molecules that are generally used as PS. This strategy has been applied to devise novel methods of treating cancer, infections and heart disease.

Cancer. Conjugates between PS and modified albumin can be readily and specifically taken up by macrophages via the high capacity scavenger receptor. Tumor associated macrophages (TAMs) can be selectively killed or modified by the appropriate PDT regimen. It has become apparent in recent years that TAMs are partly responsible for the growth, invasion and metastasis of tumors and are therefore a valid target for cancer therapy. This may be accomplished by a binary approach in which the PS-conjugate targets the macrophages and the spatial confinement of the light delivery ensures that only TAMs (bad) are killed and other macrophages (good) are spared. In addition, I have recently begun to concentrate on more closely defining the anti-tumor effects of PDT by using various syngeneic mouse tumors in immunocompetent mice. Research goals here include the identification of specific PDT regimens, and immunostimulants (toll-like receptor ligands) to maximize the generation of anti-tumor immunity.

PDT for localized infections. Polycationic chlorin e6 conjugates with a pronounced positive charge are able to effectively target bacteria (both Gram (+) and Gram (-)) for photodestruction. This is thought to be mediated by the structure of the polycationic carrier being able to disrupt the outer-membrane permeability barrier typical of Gram (-) bacteria, while Gram (+) species are very susceptible to PDT. Considerable data on the structure-function relationships of these conjugates and their efficiency in photodynamic inactivation of *Pseudomonas aeruginosa*, *Escherichia coli*, and *Staphylococcus aureus* have been accumulated, and in optimum doses can give six logs of killing. Multi-antibiotic resistant bacteria can be killed as easily as naive strains. I have developed several mouse models of infections using pathogenic bacteria transfected with the gene complex coding for luciferase and its substrates and a sensitive photon-counting camera to image the light emitted from the animals in real time to follow the progress of the infection. These now comprise excisional wounds, soft tissue infections in neutropenic and immunocompetant mice, chronic abscesses, burns and bladder infections. Topical or interstitial administration of conjugates, followed by illumination eradicates the infection, and in the case of pathogenic strains, save the lives of the mice which would otherwise die of systemic sepsis. The treatment does not damage host tissue as shown by the wound healing response being as good as or better than control wounds treated by alternative antimicrobial therapies.

Diagnosis and therapy of vulnerable atherosclerotic plaque (VP). It is now accepted that the non-stenotic highly inflamed atherosclerotic plaque with a thin collagen

cap in the coronary arteries is vulnerable to rupture, frequently causing a massive coronary thrombosis and sudden death. Since most patients with vulnerable plaque have no prior symptoms of heart disease, there is increasing interest in technologies to both detect and treat VP. It is clear that the most important cellular component and causative agent within VP is the activated macrophage, which is responsible for collagen cap degradation by secreting matrix metalloproteinases thus increasing likelihood of rupture. Since the scavenger-targeted conjugates (modified serum albumin, see above) show a high degree of selectivity for macrophages, they are an attractive targeting vehicle for delivering fluorescent dyes to VP allowing intravascular fluorescence diagnosis, and delivering photoactive dyes allowing photodynamic stabilization of VP by increasing the fibrous cap and reducing the inflammatory macrophages.

B. Research Funding Information:

Past

1994-1996 NIH/R01 - Co-Investigator (T. Hasan, PI)
Experimental Photoimmunotherapy of Ovarian Cancer.

1996-1998 Periodontix Inc. - Co-Investigator (T. Hasan, PI)
Photodynamic therapy of periodontitis.

2004-2004 Department of Defense - Co-Investigator (JA Parrish, PI)
Program to Develop Biomedical Applications of the Free Electron Laser Photoimmunotherapy for the local control of sepsis.

2004-2005 Department of Defense - Co-Investigator (JA Parrish, PI)
Program to Develop Biomedical Applications of the Free Electron Macrophage targeted photodynamic regulation of wound healing.

1997-2000 NIH/R01 - Co-Investigator (T. Hasan, PI)
Experimental Photoimmunotherapy of Ovarian Cancer.
(competing continuation)

1999-2002 Department of Defense - Surgical Laser Applications from MFEL studies - Project leader (JA Parrish, PI)
Photodynamic destruction of tissue invasive pathogens in animal burn models.

2001-2002 CIMIT New Concept Award - Principal Investigator
Macrophage-targeted PDT for diagnosis and therapy of vulnerable plaque. $25,000 direct

2002-2003 DAMD 17-02-2-0006 - CIMIT Proof-of Principle Award - Principal Investigator Macrophage-targeted PDT for diagnosis and therapy of vulnerable plaque. $75,000 direct

2001-2003 Seedling Enterprises - Principal Investigator. Light-mediated killing of *Helicobacter pylori:* an in vitro and ex vivo study. $102,000 direct

Current

1999-2003 N00014-94-1-0927 Department of Defense - Program to Develop Biomedical Applications of the Free Electron Laser - Project leader (JA Parrish, PI)
Photodynamic inactivation of pathogenic bacteria in contaminated wounds.

2001-2006 NIH/1 PO1 CA84203-01- Core Director (Program Director T. Hasan)
In vivo PDT: Animals, Dosimetry and Statistics Core. $924,115 direct

2002-2005 NIH/R01 CA/AI838801-A2- Principal Investigator
Macrophage-targeted PDT. $435,000 direct

2002-2007 NIH/BRP- 1R01 EY14106-01 - Project Leader (CP Lin, PI)
Live microscopy and cytometry in vascular biology. $506,704 direct

2002-2005 NIH/R01 - Investigator (NS Soukos, PI)
Photosensitization of oral bacteria. 5% effort ($450,000 direct)

2004-2006 CIMIT New concept Award - Principal Investigator
Macrophage-Targeted Fluorescent Detection of vulnerable plaque. $25,000 direct

2003-2007 NIH/1R01 AI050875-01A1 - Principal Investigator -
Photodynamic Therapy for the Treatment of Localized Infections. $700,000 direct

2003-2004 NIH/SBIR (T. Wharton PI). Sub-contract PI
Novel Nanostructures for Photodynamic Therapy. $62,000

2003-2004 LumeRx Corp - Principal Investigator. Phototherapy for *Helicobacter pylori* infection. $102,000 direct

Pending

2003 NIH/SBIR (H. Gali PI)- Sub-contract PI
Receptor-Targeted Photosensitizers for PDT of Cancers. $30,000 direct

2003	TSWG DAAD05-03-T-0024 DHS BAA, Principal investigator, $140,000 direct
2003	NIH/NIAID R01, Principal investigator, PDT for Buruli Ulcer Disease, $600,000 direct
2003	NIH/SBIR, (T. Wharton PI)- subcontract PI, Photodynamic Blood Product Decontamination, $69,620 direct
2003	NIH/SBIR (H Gali, PI) – subcontract PI, Novel nanoparticles for targeted photothermal therapy. $65,240 direct
2004	NIH/NHLBI R01, Principal investigator, Targeted PDT for vulnerable atherosclerotic plaque. $1,250,000 direct.

C. Teaching Experience:

1. Local Contributions:

Undergraduate and Graduate Courses:

1970-1971	Chemistry Master, St. Hughs High School, Birkenhead, U.K. Taught chemistry to GCE 'O' level (full time teaching)
1972-1976	Research Assistant Demonstrator, Trent Polytechnic. Taught lecture course in first year organic chemistry to B.Sc. Hons Applied Science students (approx 60 students, 12 hours/year) Jointly ran laboratory classes in organic chemistry for all four years of B.Sc. Hons Applied Science course (120 hours/year). Conducted tutorials in organic chemistry for all four years of B.Sc. Hons Applied Science course (80 hours/year)
1982-1984	Supervisor, University of Cambridge. Conducted supervisions in organic chemistry for Trinity and Churchill colleges (50 hours/year).
1984-1987	Demonstrator, Leicester University Jointly conducted laboratory classes in organic chemistry for all three years of B.Sc. Hons Chemistry course (100 hours/year).
1994-	Delivered tutorial lectures in Wellman Laboratories Photomedicine Lecture Series

1997 Course on Photodynamic Therapy and Fluorescence Diagnosis for the Electro-Optics Center, Tufts University, Medford MA.

Advisees, Trainees:

1976-1978 One post-graduate student

1979-1982 Two post-graduate students

1982-1984 Two post-graduate students

1984-1987 Two post-graduate students

1990-1994 One post-graduate student, two post-doctoral fellows one technician

1994- Fifteen undergraduate students,

Imran Rizvi	1994-1997	Wellman Laboratories
Jaimie Miller	1994-1997	Wellman Laboratories
Pradeep Penta	1997	MIT
Naveen Murthy	1997	GlycoGenesis Inc
Yeshaya Koblick	1999	Tufts University
David Adam	2000	University of Toronto
Zaraq Khan	2001	Aga Khan Medical College
Azadeh Shirazi	2002	University of Kentucky
Aamir Ahmad	2002	Aga Khan Medical College
Maria Maqsood	2002	Aga Khan Medical College
Maleha Khan	2002	Aga Khan Medical College
Imran Khan	2003	Aga Khan Medical College
Umber Khan	2003	Aga Khan Medical College
Miram Afridi	2003	Aga Khan Medical College
Madiha Kamal	2003	Aga Khan Medical College

Seventeen post-doctoral fellows,

Tetsuo Momma MD	1994-1996	Tokyo University Hospital
Nikolaos Soukos DDS, PhD	1994-2000	Forsyth Institute, Boston

Marco Del Governatore MD	1994-1996	University of Bologna, Italy
Linda Duska MD	1995-1997	Massachusetts General Hospital
Frank Konig MD	1996-1998	Charite Hospital, Berlin
Misbah Huzaira MD	1997	Massachusetts General Hospital
Tetsuya Kodama PhD	1998-2000	Imperial College, London
Touqir Zahra MD	2000-2001	Newton Wellesley Hospital
Zihua Wang, Ph.D.	2002	Boston Biotech
Faten Gad, M.D.	2002-	Wellman Laboratories
Qingde Liu, M.D., Ph.D.	2002-	Wellman Laboratories
Ana Patricia Castano, M.D.	2002-	Wellman Laboratories
Xun Sun, Ph.D.	2002	Wellman Laboratories
Andrea Bell, Ph.D.	2002	Leeds University, UK
George Tegos, Ph.D.	2003-	Wellman Laboratories
Changming Yang	2003	Wellman Laboratories
Florencia Anatelli	2003	Wellman Laboratories

Eleven technicians.

Jaimie Miller BS	1997-1999	Columbia University
Imran Rizvi, BS	1997-2002	Georgetown University
Michael Bamberg BS	1994-1999	Ilex Oncology
David O'Donnell BS	1998-2000	Fleet Boston Financial
Atosa Ahmadi BS	2000-2001	Suffolk University
Jeremy Stern, BS	2001-	Wellman Laboratories
Samuel J Whitaker, BS	2002	Philadelphia
Stephanie Chirico, BS	2002-	Wellman Laboratories
Jennifer Viveiros, BS	2002-	Wellman Laboratories
Tatiana Demidova, MS	2002-	Wellman Laboratories
Victoria Hamrahi, BS	2002-	Shriners Burn Institute

2. Regional, national, or international contributions

1994 Photochemical Targeting and Medical Applications
IEEE Lasers and Electro-Optics Society LEOS 94, Boston, MA.

1997 Light mediated modulation of wound healing, in the Plenary Session 6: Laser Tissue Interactions and Wound Healing, of the Twentieth Biennial Cornea Research Conference, Massachusetts Eye and Ear Infirmary, Boston, MA.

1999 Photodynamic antisepsis, ONR Contractors Meeting, Institute of Surgical Research, Fort Sam Houston, San Antonio, TX

2005 Photodynamic therapy: mechanisms, targeting, and applications, Duke Medical Free Electron Laser Laboratory Duke University, Durham, NC

1999 Photodynamic inactivation of pathogenic bacteria in contaminated wounds, MFEL-ONR contractors meeting, Newport Beach, CA

1999 Use of luminescent bacteria to demonstrate photodynamic inactivation in contaminated wounds, Dept of Pediatrics, Stanford University School of Medicine, Stanford, CA

2000Targeted photosensitizer conjugates: specific and versatile? Photodynamic Therapy Center, Roswell Park Cancer Center, Buffalo, NY

2002 Scavenger receptor-targeted photodynamic therapy of J774 tumors in mice: tumor response and concomitant immunity. BioS 2002 Biomedical Optics, SPIE Photonics West, Laser Tissue Interaction XIII: Photochemical, Photothermal, and Photomechanical. San Jose, CA

2002 Use of genetically engineered bioluminescent bacteria to develop animal models of localized infections suitable for photodynamic therapy. IQEC/LAT2002 Conference on Lasers, Applications and Technologies, Moscow, Russia

2002 Degree of substitution of chlorine6 conjugated to charged poly-L-lysine chains affects their cellular uptake, localization and phototoxicity. Saratov International Workshop on Biophotonics – SIWB02 Saratov, Russia

2002 Scavenger receptor-targeted photodynamic therapy for diagnosis of vulnerable atherosclerotic plaques. Saratov International Workshop on Biophotonics – SIWB02 Saratov, Russia

2003 Photodynamic therapy of mouse tumors; local control and anti-tumor immunity. (Invited Lecture).BioS 2003 Biomedical Optics, SPIE Photonics West, Laser Tissue Interaction XIV: Photochemical, Photothermal, Photomechanical, San Jose, CA

2003 Induction of anti-tumor immunity by photodynamic therapy of mouse tumors. (Invited Lecture). 31st Annual Meeting of American Society for Photobiology, Baltimore, MDInvited Chair - Contributed papers session 1, 31st Annual Meeting of American Society for Photobiology, Baltimore, MD

2004 Induction of anti-tumor immunity by photodynamic therapy of mouse tumors.

(Invited Lecture). BioS 2004 Biomedical Optics, SPIE Photonics West, Laser Tissue Interaction XV: Photochemical, Photothermal, Photomechanical, San Jose, CA

2004 Invited chair - Session 6, Optical Techniques for Tumor Treatment and Detection:
Mechanisms and Techniques in Photodynamic Therapy XIII, BioS 2004 Biomedical Optics, SPIE Photonics West, San Jose, CA

2004 Invited chair - Session 2, Laser Tissue Interaction XV: Photochemical, Photothermal, Photomechanical,, BioS 2004 Biomedical Optics, SPIE Photonics West, San Jose, CA

PART III: BIBLIOGRAPHY

Original Reports:

1 Coutts IG, **Hamblin MR.** Synthesis of N,N-diaryltoluene-4-sulphonamides. J Chem Soc Perkin I 1975:2445-46.

2 Coutts IG, **Hamblin MR.** An unusual reaction of methylmagnesium iodide with cyclohexadienones. J Chem Soc Chem Commun 1976:58-59.

3 Coutts IG, **Hamblin MR**, Tinley EJ. The enzymatic oxidation of phenolic tetrahydroisoquinoline-1-carboxylic acids. J Chem Soc Perkin I 1979:2744-50.

4 Grundon MF, **Hamblin MR**, Harrison DM. Biosynthesis of Aromatic Isoprenoids Part 5: The preparation of 1-(3,3-dimethylallyl)-L-tryptophan and cyclo-L-alanyl tryptophan and their non-incorporation into echinulin. J Chem Soc Perkin I 1980:1294-98

5 Buchanan JG, **Hamblin MR**, Sood GR, Wightman RH. The biosynthesis of pyrazofurin and formycin. J Chem Soc Chem Commun 1980:917-18.

6 Coutts IG, **Hamblin MR.** Synthesis of spiroheterocycles by oxidative coupling of phenolic sulphonamides. J Chem Soc Chem Commun 1980:949-50.

7 Coutts IG, **Hamblin MR.** Spirodienones Part 2: The synthesis of some heterocyclic spirodienones by phenolic coupling. J Chem Soc Perkin I 1981:493-97.

8 Buchanan JG, **Hamblin MR**, Kumar A, Wightman RH. The biosynthesis of showdomycin – Studies with stable isotopes and the determination of principal precursors. J Chem Soc Chem Commun 1984:1515-17.

9 **Hamblin MR**, Potter BV. E. coli Ada regulatory protein repairs the SP diastereoisomer of alkylated DNA. FEBS Lett 1985;189(2):315-17.

10 **Hamblin MR**, Cummins JH, Potter BV. Mung bean nuclease catalyzes DNA cleavage with inversion of configuration at phosphorous. Biochem Soc Trans 1986;14:899-900.

11 **Hamblin MR**, Potter BV, Gigg R. Bisphosphorylation of a vic-diol using a phosphite chemistry approach. Synthesis of myo-inositol 4,5-bisphosphate. J Chem Soc Chem Commun 1987:626-27.

12 **Hamblin MR**, Flora JS, Potter BV. Myo-Inositol phosphorothioates, phosphatase-resistant analogues of myo-inositol phosphates. Synthesis of DL-myo-inositol 1,4-bisphosphate and DL-myo-inositol 1,4-bisphosphorothioate. Biochem J 1987;246(3):771-74.

13 **Hamblin MR**, Potter BV, Gigg R. Synthesis of myo-inositol phosphates and analogues using a phosphite chemistry approach. Biochem Soc Trans 1987;15:415-16.

14 **Hamblin MR**, Cummins JH, Potter BV. Mung bean (Phaseolus aureus) nuclease. A mechanistic investigation of the DNA-cleavage reaction using a dinucleoside phosphorothioate. Biochem J 1987;241(3):827-33.

15 **Hamblin MR**, Newman EL. Photosensitizer targeting in photodynamic therapy. I. Conjugates of haematoporphyrin with albumin and transferrin. J Photochem Photobiol B 1994;26(1):45-56.

16 **Hamblin MR**, Newman EL. Photosensitizer targeting in photodynamic therapy. II. Conjugates of haematoporphyrin with serum lipoproteins. J Photochem Photobiol B 1994;26(2):147-57.

17 Molpus KL, Kato D, **Hamblin MR**, Lilge L, Bamberg M, Hasan T. Intraperitoneal photodynamic therapy of human epithelial ovarian carcinomatosis in a xenograft murine model. Cancer Res 1996;56:1075-82.

18 **Hamblin MR**, Miller JL, Hasan T. The effect of charge on the interaction of site-specific photoimmunoconjugates with human ovariancancer cells. Cancer Res 1996; 56:5205-10.

19 Duska LR, **Hamblin MR**, Bamberg MP, Hasan T. Biodistribution of charged $F(ab')_2$ photoimmunoconjugates in a xenograft model of ovarian cancer. Br J Cancer 1997;75:837-44. (the first two authors made equal contributions)

20 Soukos NS, **Hamblin MR**, Hasan T. The effect of charge on cellular uptake and phototoxicity of polylysine $chlorin_{e6}$ conjugates. Photochem Photobiol 1997;65:723-29. (the first two authors made equal contributions)

21 Momma T, **Hamblin MR**, Hasan T. Hormonal modulation of the accumulation of 5-aminolevulanic acid-induced protoporphyrin and phototoxicity in prostate cancer cells. Int J Cancer 1997;72:1062-69.

22 Soukos NS, Ximenez-Fyvie LA, **Hamblin MR,** Socransky SS, Hasan T. Targeted antibacterial photochemotherapy. Antimicrob Agents Chemother 1998;42:2595-01.

23 **Hamblin MR**, Bamberg MP, Miller JL, Hasan T. Cationic photoimmunoconjugates between monoclonal antibodies and hematoporphyrin: selective photodestruction of ovarian cancer cells. Applied Optics, 1998;37:7184-92.

24 Momma,T, **Hamblin MR,** Wu HC, Hasan T. Photodynamic therapy of orthotopic prostate cancer with benzoporphyrin derivative: local control and distant metastasis. Cancer Res, 1998;58:5425-5431.

25 **Hamblin MR,** Rajadhyaksha M, Momma T, Soukos NS, Hasan T. *In vivo* fluorescence imaging of the transport of charged $chlorin_{e6}$ conjugates in a rat orthotopic prostate tumor. Br J Cancer 1999;81:261-68.

26 Duska LR, **Hamblin MR**, Miller JL, Hasan T. Photoimmunotherapy in combination with cisplatinum administration for the treatment of advanced epithelial ovarian cancer. J Natl Cancer Inst 1999;91:1557-63.

27 Khadem J, Veloso Jr. AA, Tolentino F, Hasan T, **Hamblin MR.** Photodynamic tissue welding with chlorin(e6) protein conjugates. Invest Ophthal Vis Sci 1999;40:3132-37.

28 Del Governatore M, **Hamblin MR**, Piccinini EE, Ugolini G, Hasan T. Targeted photodestruction of human colon cancer cells using charged 17.1a chlorin$_{e6}$ immunoconjugates. Br J Cancer 2000;82:56-64.

29 Molpus KL, **Hamblin MR**, Rizvi I, Hasan T. Intraperitoneal photoimmunotherapy of ovarian carcinoma xenografts in nude mice using charged photoimmunoconjugates. Gynecol Oncol 2000;76:397-404.

30 Del Governatore M, **Hamblin MR**, Shea CR, Rizvi I, Molpus KG, Tanabe K, Hasan T. Experimental photoimmunotherapy of hepatic metastases of colorectal cancer with a 17.1A chlorin$_{e6}$ immunoconjugate. Cancer Res, 2000;60:4200-05.

31 Kodama T, **Hamblin MR,** Doukas, AG. Cytoplasmic molecular delivery with shock waves: importance of impulse. Biophysical J, 2000;79:1821-32.

32 **Hamblin MR,** Miller, JL, Ortel B. Scavenger-receptor targeted photodynamic therapy. Photochem Photobiol 2000;72:533-40.

33 **Hamblin MR,** Del Governatore M, Rizvi I, Hasan T. Biodistribution of charged 17.1a photoimmunoconjugates in a murine model of hepatic metastasis of colorectal cancer. Br J Cancer 2000;83:1544-51.

34 Soukos NS, **Hamblin MR,** Keel S, Fabian RL, Deutsch TF, Hasan T. Epidermal growth factor receptor targeted immunophotodiagnosis and photoimmunotherapy of oral precancer *in vivo.* Cancer Res, 2001;61:4490-96.

35 **Hamblin MR,** Miller JL, Rizvi I, Ortel B, Maytin EV, Hasan T. Pegylation of a chlorin$_{e6}$ polymer conjugate increases tumor targeting of photosensitizer. Cancer Res 2001;61:7155-62.

36 **Hamblin MR,** O'Donnell DA, Murthy N, Contag CH, Hasan T. Rapid control of wound infections by targeted photodynamic therapy monitored by in vivo bioluminescence imaging. Photochem Photobiol 2002;75:51-57.

37 Kodama T, Doukas, AG, **Hamblin MR.** Shock wave-mediated molecular delivery into cells. Biochem Biophys Acta 2002;1542:186-94.

38 **Hamblin MR,** O'Donnell DA, Murthy N, Rajagopalan K, Michaud N, Sherwood ME, Hasan T. Polycationic photosensitizer conjugates: photodynamic inactivation of bacteria depends on conjugate structure and Gram classification. J Antimicrob Chemother 2002;49:941-51.

39 **Hamblin MR,** Miller JL, Rizvi I, Ortel B. Degree of substitution of chlorin(e6) conjugated to charged poly-L-lysine chains affects their cellular uptake, localization and phototoxicity towards macrophages and cancer cells. J X-ray Science and Technology 2002;10:139-52.

40 Kodama T, Doukas, AG, **Hamblin MR.** Delivery of ribosome-inactivating protein toxin into cancer cells with shock waves. Cancer Lett 2003;189:69-75.

41 **Hamblin MR,** Zahra T, Contag CH, McManus AT, and Hasan T. Optical monitoring and treatment of potentially lethal wound infections *in vivo*. J Infect Dis 2003;187:1717-25.

42 **Hamblin MR,** Miller JL, Rizvi I, Loew HG, and Hasan T. Pegylation of charged polymer-photosensitizer conjugates: effects on photodynamic efficacy. Br J Cancer, 89: 937-943, 2003

43 Gad F, Zahra T, Francis KP, Hasan T, and **Hamblin MR.** Targeted photodynamic therapy of established soft-tissue infections in mice. Photochem Photobiol Sci (*In Press*, 2003).

44 **Hamblin MR** and Hasan T. Photodynamic therapy: a new antimicrobial approach to infectious disease? Photochem Photobiol Sci (*In press* 2003).

45 Gad F, Zahra T, Hasan T, and **Hamblin MR.** Photodynamic inactivation of Gram-positive pathogenic bacteria: effect of growth phase and extracellular slime. Antimicrob Agents Chemother (*in press* 2004).

46 Shi L, Takahashi K, Dundee J, Karni-Shahroof S, Thiel S, Jensenius JC, Gad F, **Hamblin MR,** Sastry KN, Ezekovitz RA. The mannose-binding lectin plays a key role in limiting early and ongoing systemic infection with *Staphylococcus aureus*. J Clin Invest (*Submitted* 2003)

47 Liu Q and **Hamblin MR,** Macrophage-targeted photodynamic therapy: scavenger receptor expression and activation state. Photochem Photobiol (*submitted* 2003).

48 Demidova TN and **Hamblin MR,** Targeted photodynamic therapy to inflammatory cells and pathogens. Int J Immunopathol Pharmacol *(submitted 2003)*.

Proceedings of Meetings:

1 **Hamblin MR,** Newman EL. Conjugates between proteins and fluorescent dyes as potential photosensitizers. In: dal Fante M, Spinelli P, Marchesini R, editors. Photodynamic Therapy and Biomedical Lasers. Proceedings of the International Conference on Photodynamic Therapy and Medical Laser Applications; Sep 4-10, 1992 Milan, Italy. Amsterdam: Elsevier; 1992. p. 518-20.

2 Soukos NS, **Hamblin MR**, Deutsch TF, Hasan T. Monoclonal antibody-tagged receptor-targeted contrast agents for detection of cancers. In: Bearman GH; Bornhop DJ; Levenson RM; Editors. Biomarkers and Biological Spectral Imaging, Jan 19-23, 2001, Bellingham, WA, The International Society for Optical Engineering, Proceedings of SPIE; 2001. p. 115-28. 4259

3 **Hamblin MR,** O'Donnell DA, Zahra T, Contag CH, McManus AT, Hasan T. Targeted photodynamic therapy for infected wounds in mice. In: Dougherty TJ editor, Optical methods for tumor treatment and detection: Methods and techniques in Photodynamic therapy XI, Jan 20-24, 2002, Bellingham, WA, The

International Society for Optical Engineering, Proceedings of SPIE; 2002. Vol 4612: p.48-58.

4 **Hamblin MR,** O'Donnell DA, Huzaira M, Zahra T. Scavenger receptor-targeted photodynamic therapy of J774 tumors in mice: tumor response and concomitant immunity. (Invited paper). In: Jacques SL, Duncan DD, Kirkpatrick SJ, Kriete A, editors, Laser Tissue Interaction XIV: Photochemical, Photothermal, and Photomechanical, Jan 25-31, 2002, Bellingham, WA, The International Society for Optical Engineering, Proceedings of SPIE; 2002. Vol 4617: p. 1-10.

5 Castano AP, Gad F, Zahra T, **Hamblin MR**. Specific anti-tumor immune response with photodynamic therapy mediated by benzoporphyrin derivative and chlorin(e6). (Invited paper) In: Jacques SL, Duncan DD, Kirkpatrick SJ, Kriete A, editors, Laser Tissue Interaction XIII: Photochemical, Photothermal, and Photomechanical, Jan 25-31, 2003, Bellingham, WA, The International Society for Optical Engineering, Proceedings of SPIE; 2003, Vol 4612: p 1-9

6 **Hamblin MR,** Tawakol A. Castano AP, Gad F, Zahra T, Ahmadi A, Stern J, Ortel B, Chirico S, Shirazi A, Syed S Muller JE. Macrophage-targeted photodynamic detection of vulnerable atherosclerotic plaque. In: Gregory KW, Whittaker P, Woodburn KW Editors, Lasers in Surgery: Advanced Characterization, Therapeutics, and Systems, Jan 25-31 2003, Bellingham, WA, The International Society for Optical Engineering, Proceedings of SPIE; 2003, Vol 4949: p 466-476.

7 Gad F, Zahra T, Hasan T, and **Hamblin MR.** Targeted photodynamic therapy of established soft-tissue infections in mice. In: Kessel D, Editor, Optical Methods for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy, Jan 24-29 2004, Bellingham, WA, The International Society for Optical Engineering, Proceedings of SPIE, 2004 *in press.*

8 Castano AP, Liu Q, and **Hamblin MR.** Photodynamic therapy cures green fluorescent protein expressing RIF1 tumors in mice. In: Jaques SL, Roacch WP Editors, Laser Interaction with Tissue and Cells XV, Jan 24-29 2004, Bellingham, WA, The International Society for Optical Engineering, Proceedings of SPIE, 2004 *in press*

Reviews and Book Chapters:

1 **Hamblin MR**, Newman EL. New Trends in Photobiology: On the mechanism of the tumour-localising effect in photodynamic therapy. J Photochem Photobiol B 1994;23(1):3-8.

2 **Hamblin MR**, Hasan T. Advances in photodynamic therapy. Optics and Photonic News 1996;7(7):16-21.

3 **Hamblin MR,** Ortel B. Future directions: Photosensitizer targeting and new disease indications. In: Hader DM, Jori G, series editors. Comprehensive series in photosciences. Amsterdam, Netherlands: Elsevier Science, BV; 2001. p. 339-66. (Calzavara-Pinton PG, Ortel B, Szeimies RM, volume editors. Photodynamic therapy and fluorescence diagnosis in dermatology; vol. 2.)

4 **Hamblin MR.** Covalent photosensitizer conjugates for targeted photodynamic therapy. Trends in Photochem Photobiol 2002;9:1-24.

5 **Hamblin MR.** Photodynamic therapy. In: Syrigos KN and Harrington K, editors. Targeted therapy for cancer. Oxford UK: Oxford University Press; 2003. p. 259-72.

Abstracts:

1 **Hamblin MR**, Newman EL. Protein-porphyrin conjugates as photosensitizers. American Society for Photobiology. Chicago, IL; 1993: Photochem Photobiol 1993; 57:89S.

2 **Hamblin MR**, Bamberg M, Hasan T. The preparation of site-specific monoclonal antibody hematoporphyrin conjugates via poly-L-lysine linkers. American Society of Photobiology. Washington, DC; 1995: Photochem Photobiol 1995;61:95S.

3 **Hamblin MR**, Duska LR, Molpus KL, Bamberg MP, Hasan T. Preparation and biodistribution of site-specific immunoconjugates between OC125 anti-ovarian cancer monoclonal antibody and chlorin e_6 using poly-l-lysine linkers of opposite charge in a nude mouse xenograft model. Monoclonal Antibodies and Cancer Therapy - The Next Decade. New York, NY: Cancer Research Institute; 1995:M04.

4 Duska LR, **Hamblin MR**, Bamberg MP, Molpus K, Hasan T. Biodistribution of monoclonal antibody photosensitizer conjugates of opposite charge in a nude mouse xenograft model of ovarian cancer. NEAGO 1995.

5 Molpus KL, **Hamblin MR**, Bamberg M, Hasan T. Intraperitoneal photoimmunotherapy of human ovarian carcinoma in a xenograft model using charged conjugates. NEAGO 1996.

6 **Hamblin MR**, Rajadhyaksha M, Momma T, Hasan T. The effect of size and charge on the transport and localization of photosensitizer conjugates in an orthotopic rat prostate cancer model. American Society for Photobiology. Atlanta, GA; 1996: Photochem Photobiol 1996;63:23S.

7 Del Governatore M, **Hamblin MR**, Hasan T. Targeting hepatic metastases of colorectal cancer by charged photoimmunoconjugates. Twelfth International Conference on Photobiology. Vienna, Austria; 1996.

8 Molpus K, **Hamblin MR,** Rizvi I, Bamberg M, and Hasan T, Intraperitoneal photoimmunotherapy of human ovarian carcinoma in a xenograft model using charged conjugates. Society of Gynecological Oncologists 1997, Gynecol Oncol 64:302,1997.

9 Soukos NS, **Hamblin MR**, Ximenez-Fyvie LA, Socransky SS and Hasan T. Photolysis of oral bacteria by polylysine chlorin e6 conjugates of different charge. Gordon Research Conference on Periodontal Diseases, New England, 1997

10 **Hamblin MR,** Miller JL, Rizvi I, and Hasan T, Pegylated poly-l-lysine chlorin$_{e6}$ conjugates as photosensitizers. American Society for Photobiology, St Louis MO; 1997: Photochem Photobiol 1997; 65: 8S.

11 **Hamblin MR**, Momma T, and Hasan T. Experimental intraoperative photodynamic therapy for prostate cancer. American Society for Photobiology, St Louis MO; 1997: Photochem Photobiol 1997;65:60S.

12 **Hamblin MR,** Miller JL, Rizvi I, and Hasan T. Targeted photosensitization with pegylated poly-l-lysine chlorin e6 conjugates. Europto Series: Photochemotherapy of cancer and other diseases, BiOS '97 San Remo, Italy 1997

13 **Hamblin MR,** Soukos NS, and Hasan T, Selective photoinactivation of gram positive and gram negative bacteria while sparing mammalian cells. European Society for Photobiology, Stresa, Italy; 1997.

14 **Hamblin MR,** Duska LR, del Governatore M, Momma T, and Hasan T, Tumor targeting and tissue transport of charged poly-l-lysine chlorin$_{e6}$ conjugates. European Society for Photobiology, Stresa, Italy; 1997.

15 Hasan T, Duska LR, Miller J, and **Hamblin MR**, Photodynamic therapy with a photoimmunoconjugate in combination with cisplatinum administration for the treatment of advanced epithelial ovarian cancer. American Society of Clinical Oncology 34th Annual Meeting, Los Angeles, CA, 1998.

16 Rizvi I, **Hamblin MR,** Miller JL, Ortel B, Maytin EV, and Hasan T, Selective targeting of intraperitoneal tumors, 7th Biennial Congress of the International Photodynamic Association, Nantes, France, 1998.

17 **Hamblin MR,** Miller JL, Rizvi I, Ortel B, Maytin EV, and Hasan T, Mechanism of differential phototoxicity after pegylation of poly-l-lysine chlorin e6 conjugates. American Society for Photobiology, Snowbird, UT, 1998: Photochem Photobiol 1998; 67: 24S.

18 **Hamblin MR,** Penta P, Ortel B, and Hasan T, Targeting phototoxicity to macrophages via albumin photosensitizer conjugates. American Society for Photobiology, Snowbird, UT; 1998: Photochem Photobiol 1998; 67: 92S.

19 Goslee M, Khadem J, Tolentino F, **Hamblin MR,** and Hasan T, Photodynamic tissue adhesion with chlorin (e6) protein conjugates, Association for Research in Vision and

Ophthalmology (ARVO), Fort Lauderdale, FA 1999: Invest Ophthalmol Vis Sci 1999; 40: S341

20 **Hamblin MR,** O'Donnell D, Murthy N, Rizvi I, and Hasan T. Targeted photoinactivation of gram negative bacterial contamination in wounds, European Society for Photobiology, Granada, Spain; 1999

21 Hasan T, Moor ACE, Ortel B, Rizvi I, and **Hamblin MR**, Targeted photosensitization, subcellular targeting and cell death, European Society for Photobiology, Granada, Spain; 1999

22 Hasan T, **Hamblin MR,** Moor ACE, Ortel B, Rizvi I, Savellano M. Selective subcellular localization of photosensitizers and consequent phototoxicity, 3rd International Symposium on Photodynamic Diagnosis and Therapy in Clinical Practice, Innsbruck, Austria, October 1999.

23 Kodama T, **Hamblin MR,** and Doukas, AG, Cytoplasmic molecular delivery with shock waves, American Society for Biochemistry and Molecular Biology and American Society for Pharmacology and Experimental Therapeutics Joint Meeting, Boston MA, 2000. FASEB J. 14, A1473, 2000

24 Soukos NS, **Hamblin MR**, Deutsch TF, Fabian RL, Keel S, Hasan T. Epidermal growth factor receptor targeted immunophotodiagnosis of oral precancer. IADR/AADR/CADR 78th General Session, Washington DC, 2000. J Dent Res, 79, SI165, 2000

25 **Hamblin MR,** O'Donnell DA, Murthy N, Rajagopalan K, Sherwood ME and Hasan T, Photoinactivation of antibiotic-resistant bacteria using polycationic photosensitizer conjugates, 13th International Congress on Photobiology, San Francisco, CA, 2000

26 **Hamblin MR,** O'Donnell DA, Murthy N, Contag CH, McManus AT, and Hasan T, Photodynamic inactivation of luminescent bacteria in contaminated and infected wounds in the mouse, 13th International Congress on Photobiology, San Francisco, CA, 2000

27 **Hamblin MR,** Del Governatore M, Shea CR, Rizvi I, Molpus KL, and Hasan T, Experimental photoimmunotherapy for treatment of hepatic metastases of colorectal

cancer in the mouse, 13th International Congress on Photobiology, San Francisco, CA, 2000

28 **Hamblin MR,** Huzaira M, and O'Donnell DA, Scavenger receptor-targeted photodynamic therapy of murine tumors in vivo, 13th International Congress on Photobiology, San Francisco, CA, 2000

29 Hasan T, **Hamblin MR,** Moor AC, Ortel B, Rizvi I, and Savellano M, Targeted photosensitization in the optimization of PDT 13th International Congress on Photobiology, San Francisco, CA, 2000

30 Hasan T, **Hamblin MR,** Moor ACE, Ortel B, Rizvi I, Savellano M. Strategies for enhanced selectivity in photosensitization., First International Conference on Porphyrins and Phthalocyanines (ICPP-1) PDT Symposium, Djion, France, 2000.

31 **Hamblin MR,** O'Donnell DA, Murthy N, Contag CH, McManus AT, and Hasan T, Photodynamic therapy for wound infections.8th International Photodynamic Association Congress, Vancouver, BC, Canada, 2001

32 **Hamblin MR,** Huzaira M, and O'Donnell DA, Scavenger receptor-targeted photodynamic therapy of murine tumors in vivo, 8th International Photodynamic Association Congress, Vancouver, BC, Canada, 2001

33 Okumura A, **Hamblin MR,** Hasan T, Ishikawa T, Kakumu S, Takahashi H, Apoptosis is induced by caspase activation and cytochrome c release in photodynamic therapy (PDT) of human hepatocellular carcinoma cells. Gastroenterology, **120**: 1866 Suppl, 2001.

34 **Hamblin MR,** O'Donnell DA, Zahra T, Contag CH, McManus AT, and Hasan T. Targeted photodynamic therapy for infected wounds in mice. Optical Techniques for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy XI, BioS 2002 Biomedical Optics, Photonics West, San Jose, CA, 2002.

35 **Hamblin MR,** O'Donnell DA, Huzaira M, and Zahra T. Scavenger receptor-targeted photodynamic therapy of J774 tumors in mice: tumor response and concomitant immunity (Invited paper). Laser Tissue Interaction XIII: Photochemical, Photothermal, Photomechanical, BioS 2002 Biomedical Optics, Photonics West, San Jose, CA, 2002.

36 Tawakol A, Fischman AJ, Hasan T, Zahra T, Muller JE, and **Hamblin MR** Accumulation of a novel macrophage-targeting photodynamic compound within lipid-rich atherosclerotic plaques, 51st Annual Meeting of the American College of Cardiology, ACC-02, #842-2, Atlanta, GA, 2002.

37 **Hamblin MR,** Tawakol A. Ahmadi A, Zahra T, Syed S, Ortel B, Fischman AJ, and Muller JE. Scavenger receptor-targeted photodynamic therapy for diagnosis and treatment of vulnerable atherosclerotic plaques. 30th Annual Meeting of the American Society for Photobiology, Quebec City, Canada, 2002.

38 **Hamblin MR,** Ahmadi A, Tolkoff MJ, and Zahra T, Light-mediated killing of Helicobacter pylori in vitro and ex vivo. 30th Annual Meeting of the American Society for Photobiology, Quebec City, Canada, 2002.

39 **Hamblin MR,** Zahra T, Francis KP, and Hasan T. Targeted photodynamic therapy for Staphylococcus aureus soft tissue infections in vivo monitored by bioluminescence imaging. 30th Annual Meeting of the American Society for Photobiology, Quebec City, Canada, 2002.

40 **Hamblin MR,** Zahra T, Hasan T, and Francis KP. Use of genetically engineered bioluminescent bacteria to develop animal models of localized infections suitable for photodynamic therapy. International Quantum Electronics/Laser Application Technology 2002 Meeting, Moscow, Russia, 2002

41 **Hamblin MR,** Miller JL, Rizvi I, Ortel B, and Hasan T. Degree of substitution of chlorin(e6) conjugated to charged poly-L-lysine chains affects their cellular uptake, localization and phototoxicity. Saratov International Workshop on Biophotonics – SIWB02 Saratov, Russia, 2002

42 **Hamblin MR,** Tawakol A. Ahmadi A, Zahra T, Syed S, Ortel B, Fischman AJ, and Muller JE. Scavenger receptor-targeted photodynamic therapy for diagnosis of vulnerable atherosclerotic plaques. Saratov International Workshop on Biophotonics – SIWB02 Saratov, Russia, 2002

43 **Hamblin MR,** Whitaker SJ, O'Donnell DA, and Zahra T, Photodynamic therapy of mouse tumors; local control and anti-tumor immunity. (Invited paper). Laser Tissue Interaction XIV: Photochemical, Photothermal, Photomechanical, BioS 2003 Biomedical Optics, Photonics West, San Jose, CA, 2003.

44 **Hamblin MR,** Tawakol A. Ahmadi A, Zahra T, Shirazi A, Stern J, Syed S, Ortel B, Fischman AJ, and Muller JE. Macrophage-targeted photodynamic detection of vulnerable atherosclerotic plaque. Diagnostic and Therapeutic Cardiovascular Interventions XII, BioS 2003, Biomedical Optics, Photonics West, San Jose, CA, 2003.

45 Hamrahi V, **Hamblin MR,** Carter EA, Benjamin J, Francis KP, Fischman AJ, Tompkins RG. A novel method for monitoring bacterial growth in burn eschar. 35th Annual Meeting American Burn Association, Miami Beach, FL, 2003.

46 **Hamblin MR,** Castano AP, Gad F, and Zahra T. Photodynamic therapy mediated by benzoporphyrin derivative and chlorin(e6) generates tumor-specific immune response against EMT-6 tumors in Balb/c mice. 94th Annual Meeting of the American Association for Cancer Research, Toronto, Canada, 2003.

47 Tawakol A, Fischman A, Gewirtz H, Muller JE, Brady T, **Hamblin MR,** Intravascular detection of inflamed atherosclerotic plaques with a novel macrophage-targeted fluorescent photodynamic compound. ACC-03, Chicago, IL, 2003.

48 Ganz R, **Hamblin MR,** Tolkoff MJ, Ahmadi A, Zahra T. *Helicobacter pylori* and *Helicobacter mustelae* are killed by visible light, in-vitro and ex-vivo. Digestive Disease Week 2003, Orlando, FL, 2003.

49 **Hamblin MR,** Castano AP, Liu Q. Induction of anti-tumor immunity by photodynamic therapy of mouse tumors. 31st Annual Meeting of American Society for Photobiology, Baltimore, MD, 2003

50 **Hamblin MR,** Tawakol A. Migrino RQ, Chirico S, Castano AP, Gad F, Ahmadi A, Zahra T, Shirazi A, Stern J, and Muller JE. Macrophage-targeted photoactive molecules localize in vulnerable atherosclerotic plaques in vivo. 31st Annual Meeting of American Society for Photobiology, Baltimore, MD, 2003.

51 **Hamblin MR,** Demidova T, Photodynamic destruction of anthrax-like spores, 10th Congress of the European Society for Photobiology, Vienna, Austria, 2003.

52 **Hamblin MR,** Ganz RA, Viveiros J, Ahmadi A, Tolkoff MJ. Phototherapy for *Helicobacter pylori* infection: in vitro, ex vivo and Phase I clinical trial. 10th Congress of the European Society for Photobiology, Vienna, Austria, 2003.

Patents issued:

Trauner KB, Hasan T, **Hamblin MR**, inventors; Massachusetts General Hospital assignee. Inhibition of fibrosis by photodynamic therapy. US Patent 5,913,884. 1999 Jun 22.

Hasan T, **Hamblin MR**, Trauner KB, inventors; Massachusetts General Hospital assignee. Acceleration of wound healing by photodynamic therapy. US Patent 6,107,466. 2000 Aug 22.

Hasan T, **Hamblin MR,** Soukos, NS, inventors; Massachusetts General Hospital assignee. Photosensitizer conjugates for pathogen targeting. US Patent 6,462,070. 2002 Oct 8.

Hamblin MR, Khadem JJ, inventors. Massachusetts General Hospital assignee. Methods for tissue welding using laser-activated protein solders. US Patent 6,607,522. 2003 Aug 19.

Patents pending:

Hamblin MR, Tawakol A, Hasan T, Muller J, Fischman AJ, Anderson RR. inventors. Detection and therapy of Thin Capped Fibro-Atheroma with Photodynamic Compounds that Target Components of the Vulnerable Plaque. United States Patent Application 20030103995, June 5, 2003.

Fischman A, **Hamblin MR,** Tawakol A, Hasan T, Muller J, Anderson R, Elmaleh D, inventors. Methods and devices for detection and therapy of atheromatous plaque, United States Patent Application 20030082105, May 1, 2003

Invention disclosures:

Hamblin MR, inventor. Photodynamic therapy targeted to macrophages as a therapy for cancer and other diseases. Disclosed Mar 2001.

Hamblin MR, Khadem JJ, inventors. Cavitation bubbles produced by focused laser pulses to treat retinal vascular occlusion. Disclosed Mar 2001.

Hamblin MR, Kodama T, inventors. Shock waves generated by explosive micro-pellet for introduction of macromolecules into cells, tissues and lumens of vessels in vivo. Disclosed Mar 2001.

Hamblin MR, Hasan T, inventors. Targeted photodynamic therapy to destroy extracellular virulence factors of pathogenic microorganisms. Disclosed May 2001.

Tawakol A, Migrino, RQ, **Hamblin MR,** inventors. Enhanced detection and therapy of inflamed tissues using immune modulation. Disclosed Oct 2002.

Hamblin MR and Demidova T, inventors, Photodynamic destruction of bacterial spores, MGH2399, disclosed Apr 2003.

Hamblin MR, Cope R, and Hasan T, inventors, Photodynamic therapy for Buruli ulcer disease, MGH2459, disclosed Sep 2003.

Hamblin MR, Gad F, and Hasan T, inventors, Second generation polycationic photosensitizer conjugates for PDT of infectious disease, disclosed Oct 2003.